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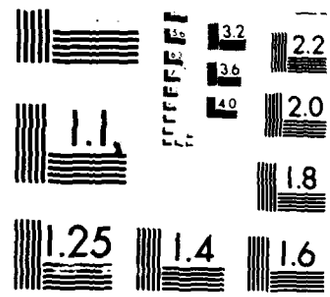

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS

AD-A178 199

PORTABLE DIAGNOSTIC RADIOMETER

Prepared for
Department of the Navy
Naval Medical Research and Development Command
National Naval Medical Center
Bethesda, MD 20014

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PORTABLE DIAGNOSTIC RADIOMETER

SUPPLEMENT TO FINAL REPORT - PHASE II

CONTRACT N00014-83-C-0524

PREPARED FOR

DEPARTMENT OF THE NAVY
NAVAL MEDICAL RESEARCH AND DEVELOPMENT COMMAND
NATIONAL NAVAL MEDICAL CENTER
BETHESDA, MD 20014

PREPARED BY

RCA LABORATORIES
DAVID SARNOFF RESEARCH CENTER
PRINCETON, NJ 08543-0432

JANUARY 1987

TABLE OF CONTENTS

SECTION		PAGE
Preface	.....	1
I.	Introduction	2
II.	Clinical evaluation of the prototype radiometer	2
III.	Instructions for using the radiometer	2
IV.	Battery charging	4
V.	Appendix	5

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PREFACE

This supplement to the Final Report for Phase II was prepared by RCA Laboratories, Princeton, New Jersey under Contract No. N00014-83-C-0524 for the Naval Medical Research and Development Command, Bethesda, Maryland. The work on Phase II was performed from July 1, 1984 through March 31, 1985 at the RCA Microwave Technology Center, Dr. Fred Sterzer, Director. The program was supervised by Markus Nowogrodzki, Head of the Microwave Subsystems and Special Projects Group. The Project Scientist was Robert W. Paglione, Member of the Technical Staff, with technical support provided by Francis J. Wozniak and Eugene C. McDermott.

I. INTRODUCTION

A full description of the microwave radiometer is given in the Final Report-Phase II previously submitted. This report presents the data that was measured clinically on one patient, and a detailed operating manual for the instrument.

II. CLINICAL EVALUATION OF THE PROTOTYPE RADIOMETER

The prototype radiometer was used to evaluate a patient with acute appendicitis symptoms at the Hospital Center at Orange, Orange, NJ on October 31, 1986. The chart for this patient is shown in Fig. 1. The skin temperatures were normal and uniform in all four quadrants. The radiometric temperatures were elevated in the lower quadrants with the highest temperature being recorded in the lower right quadrant. A burst appendix was found at the time of surgery (refer to the operative report in Fig. 2) and an appendectomy was performed. The excised specimen was sent to pathology and their findings are shown in Fig. 3.

III. INSTRUCTIONS FOR USING THE RADIOMETER

The portable radiometer system includes the prototype radiometer, a battery pack, and a tuning screwdriver as shown in Fig. 4. **PLEASE NOTE!** The thermistor that is used to monitor the surface temperature is mounted on the front surface of the antenna assembly as shown in Fig. 5. This is a very fragile assembly that protrudes beyond the surface of the foam sheet that covers the antenna. The protective cover supplied with the radiometer should remain on the antenna enclosure at all times when the unit is not in use, and when using the unit care should be taken so as not to shear the thermistor off as the radiometer is being moved around on a patient.

The radiometer power supply cord should be connected to the battery pack as shown in Fig. 6. **PLEASE NOTE!** The red terminals on the cord and battery should be connected together.

To measure a patient with the prototype radiometer, proceed with the following steps:

Step 1. Have the patient lie down on their back on a comfortable surface and expose the four quadrants for a measurement.

Step 2. Press the face of the antenna on the front of the radiometer against the left upper quadrant of the patient so that the tissues of that quadrant are touching all surfaces on the front of the antenna housing.

Step 3. Squeeze the trigger on the pistol-grip handle of the radiometer to enable the measurement sequence. A blinking cursor will appear in character position #1 on the liquid-crystal display on the rear face of the radiometer as shown in Fig. 7. The cursor blinks for up to 45 seconds until the radiometric voltage comes within the range of the linearizing equation in the microprocessor. The display then clears and the surface temperature and radiometric temperature are displayed, as shown in Fig. 8 The microprocessor software is listed in the appendix.

Step 4. Insert the male end of the adjusting screwdriver into the hole in the cover of the radiometer enclosure and engage the screwdriver slot in the potentiometer beneath the hole (Fig. 9).

Step 5. Adjust the potentiometer (ccw increases temperature) until the radiometric temperature for the upper left quadrant indicates approximately 35.0^{o}C.

Step 6. Move the radiometer in sequence from the right upper quadrant, T1, to the right lower quadrant, T4, repeating steps 2 and 3.

Step 7. Record the data on the patient's chart.

IV. BATTERY CHARGING

A battery charger has been supplied for recharging the 12V, 3.2Ah battery pack. To recharge the battery: 1) remove the cable connecting the radiometer to the battery pack; 2) plug the battery charger into a standard 110V, 60Hz single phase line; 3) connect the battery cable on the battery charger to the battery pack; 4) charge for a minimum of 5 hours; 5) disconnect the battery cable from the battery pack; and 6) unplug battery charger from the AC line. **NOTE**: It is important to follow the above sequencing or the battery charger may be damaged.

```
;*****************************************************
;*                                                   *
;*                                                   *
;*                                                   *
;*                                                   *
;*****************************************************

        BR      START
;**SUBROUTINE
        SEP     R0
DELAY   LDI     0FFH
        SMI     01H
        BNZ     PT1
        SEP     EXDLY
;**RAM ALLOCATION
        LDI     04H     ;SET RAM ADDRESS FROM 400-47F
        PHI     R2
        PHI     R3
        PHI     R4
        PHI     R5
        PHI     R6
        PHI     R7
        PHI     R8
        PHI     R9
        PHI     RA
        PHI     RB
        PHI     RC
        PHI     RD
        LDI     02H     ;R2 ADDRESS=0402H <<ACCUMULATOR>>
        PLO     R2
        LDI     03H     ;R3 ADDRESS=0403H <<NOT USED>>
        PLO     R3
        LDI     04H     ;R4 ADDRESS=0404H <<NOT USED>>
        PLO     R4
        LDI     05H     ;R5 ADDRESS=0405H <<NOT USED>>
        PLO     R5
        LDI     0BH     ;R6 ADDRESS=040BH <<STACK>>
        PLO     R6
        SEX     R6      ;SET STACK TO R6
        LDI     13H     ;R7 ADDRESS=0413H <<TEMPORARY DATA>>
        PLO     R7
        LDI     14H     ;R8 ADDRESS=0414H <<GENERAL USE>>
        PLO     R8
        LDI     15H     ;R9 ADDRESS=0415H <<NOT USED>>
        PLO     R9
        LDI     16H     ;RA ADDRESS=0416H <<MULTIPLY>>
        PLO     RA
        LDI     19H     ;RB ADDRESS=0419H <<TEMPORARY>>
        PLO     RB
        LDI     21H     ;RC ADDRESS=0421H <<MAIN LOOP>>
        PLO     RC
        LDI     22H     ;RD ADDRESS=0422H <<LOOP CNT>>
        PLO     RD
        LDI     00H     ;RE ADDRESS=0003H <<DELAY>>
        PHI     RE
        LDI     03H
        PLO     RE
        LDI     08H     ;RF ADDRESS=0800H <<DISPLAY>>
        PHI     RF
```

```
                LDI     00H
                PLO     RF
;***SYSTEM INITIALIZATION
                LDI     00H     ;SET OUTPUT LATCH TO 00H
                DEC     R6
                STR     R6
                OUT     1
                LDI     10H     ;RESET DISPLAY
                STR     RF
                SEP     RE
                LDI     01H     ;CLEAR DISPLAY
                STR     RF
                SEP     RE
                LDI     0DH     ;TURN DISPLAY ON
                STR     RF
                SEP     RE
                LDI     09H     ;SET BLINKING CURSOR
                STR     RF
                SEP     RE
                LDI     0FH     ;TURN CURSOR ON
                STR     RF
                SEP     RE
                LDI     00H     ;SET RA FOR MUX CHNL 1
                STR     RA
                STR     R2      ;INITIALIZE ACCUMULATOR
                DEC     R2
                STR     R2
                LDI     08H     ;SET LOOP CNTR TO 8
                STR     RD
                REQ             ;SET LATCHING SWITCH & CD4053 TO 4
                LDI     0FFH    ;EXECUTE DELAY
PT2             STR     R8
                SEP     RE
                LDN     R8
                SMI     01H
                BZ      PT3
                BR      PT2
;**MEASUREMENT LOOP FOR MUX CHNL #1
PT3             LDN     RA      ;SET INPUT MUX TO CHNL 1
                ADI     04H     ;GIVE A-TO-D CONVERT COMMAND
                DEC     R6      ;SET CD40257 OUTPUTS
                STR     R6
                LDN     RA
                ADI     01H
                DEC     R6
                STR     R6
                LDN     RA
                DEC     R6
                STR     R6
                OUT     1
                SEP     RE
                OUT     1
                NOP
                OUT     1
                SEP     RE
                INP     2       ;INPUT A-TO-D BITS 5,6,7,8,1,2,3,4
                ANI     0FH     ;MASK OUT BITS 5-8
                STR     R7      ;STORE IN R7
                LDN     RA      ;SET CD40257 OUTPUTS
                DEC     R6
```

```
                STR     R6
                OUT     1
                SEP     RE
                INP     2           ;INPUT A-TO-D BITS 5,6,7,8,9,10,11,12
                DEC     R7
                STR     R7          ;STORE IN R7-1
                LDN     R7          ;IF N4 < 0A7FH, RE-READ N4
                SMI     7FH
                INC     R7
                LDN     R7
                SMBI    0AH
                BM      PT3
                LDN     R7          ;ADD R7 TO ACCUMULATOR
                DEC     R6
                STR     R6
                DEC     R7
                LDN     R7
                DEC     R6
                STR     R6
                LDN     R2
                ADD
                STR     R2
                INC     R2
                IRX
                LDN     R2
                ADC
                STR     R2
                IRX
                LDN     R0          ;DECREMENT LOOP CNTR
                SMI     01H
                BZ      PT4         ;CHECK IF DONE
                STR     R0
                INC     R7
                DEC     R2
                LDI     0CH         ;EXECUTE DELAY
                BR      PT2
PT4             LDI     03H         ;DIVIDE SUM BY 8
                STR     R0
PT5             LDN     R2
                SHR
                STR     R2
                DEC     R2
                LDN     R2
                SHRC
                STR     R2
                LDN     R0          ;CHECK IF DONE
                SMI     01H
                BZ      PT6
                STR     R0
                INC     R2
                BR      PT5
PT6             LDN     R2          ;STORE AVG IN R7
                STR     R7
                INC     R2
                INC     R7
                LDN     R2
                STR     R7
;**MEASUREMENT LOOP FOR MUX CHNL 2,3, AND 4
                LDI     03H         ;SET LOOP CNTR TO 3
                STR     R0
```

```
                DEC     R7
                DEC     R7
PT7             LDN     RA      ;SET NEW MUX CHNL
                SMI     10H
                BNZ     PT8
                LDI     08H
                BR      PT9
PT8             LDN     RA
                ADI     10H
PT9             STR     RA
                LDN     RA      ;SET INPUT MUX TO CHNL 2,3, OR 4
                ADI     04H     ;GIVE A-TO-D CONVERT COMMAND
                DEC     R6      ;SET CD40257 OUTPUTS
                STR     R6
                LDN     RA
                ADI     01H
                DEC     R6
                STR     R6
                LDN     RA
                DEC     R6
                STR     R6
                OUT     1
                SEP     RE
                OUT     1
                NOP
                OUT     1
                SEP     RE
                INP     2       ;INPUT A-TO-D BITS 5,6,7,8,1,2,3,4
                ANI     0FH     ;MASK OUT BITS 5-8
                STR     R7      ;STORE IN R7
                LDN     RA      ;SET CD40257 OUTPUTS
                DEC     R6
                STR     R6
                OUT     1
                SEP     RE
                INP     2       ;INPUT A-TO-D BITS 5,6,7,8,1,2,3,4
                DEC     R7
                STR     R7      ;STORE IN R7-1
                LDN     RD      ;DECREMENT LOOP CNTR
                SMI     01H
                BZ      PT10    ;CHECK IF DONE
                STR     RD
                DEC     R7
                LBR     PT7
;**CONVERT READINGS INTO TEMPERATURES
PT10            INC     R7
                INC     R7
                INC     R7
                INC     R7
                LDI     0FFH    ;SET MATH CONSTANTS FOR
                STR     RC      ;SURFACE THERMISTOR
                LDI     70H
                DEC     RC
                STR     RC
                LDI     20H
                DEC     RC
                STR     RC
                LDI     0F1H
                DEC     RC
                STR     RC
```

```
        LDI     20H     ;SET CON[illegible]
        STR     R0
;**
        LDI     20H     ;ENABLE CONSOLE
        DEC     R6
        STR     R6
        OUT     1
        LDI     00H     ;INITIALIZE ACCUMULATOR
        STR     R2      ;REG. (R2 & R2-1)
        DEC     R2
        STR     R2
        INC     R2
;**
        LDI     0F2H    ;DIVIDE N BY A CONSTANT
        DEC     R6
        STR     R6
        LDN     R7      ;LOAD LSB
        DEC     R6
        STR     R6
        INC     R7
        LDN     R7      ;LOAD MSB
        DEC     R6
        STR     R6
        LDN     RC      ;LOAD CONSTANT
        DEC     R6
        STR     R6
        LDI     0FCH
        DEC     R6
        STR     R6
        OUT     7
        OUT     4
        OUT     6
        OUT     5
        OUT     7
        LDI     0F0H
        DEC     R6
        STR     R6
        OUT     7
        INP     6       ;STORE REMAINDER IN RB
        STR     RB
;**
        LDI     0F9H    ;MULTIPLY QUOTIENT BY A CONST[illegible]
        DEC     R6
        STR     R6
        INC     RC
        LDN     RC      ;LOAD CONSTANT
        DEC     R6
        STR     R6
        LDI     0F0H
        DEC     R6
        STR     R6
        OUT     7
        OUT     4
        OUT     7
        LDI     0F0H
        DEC     R6
        STR     R6
        OUT     7
        INP     6
        DEC     RB
```

```
                STR     RB      ;STORE MSB OF PRODUCT IN RB-1
                INP     5
                DEC     RB
                STR     RB      ;STORE LSB OF PRODUCT IN RB-1
;**
                LDI     0F9H    ;MULTIPLY REMAINDER BY A CONSTANT
                DEC     R6
                STR     R6
                INC     RB
                INC     RB
                LDN     RB      ;LOAD REMAINDER
                DEC     R6
                STR     R6
                LDN     RC      ;LOAD CONSTANT
                DEC     R6
                STR     R6
                LDI     0FCH
                DEC     R6
                STR     R6
                OUT     7
                OUT     4
                OUT     5
                OUT     7
                LDI     0F2H    ;DIVIDE PRODUCT BY A CONSTANT
                DEC     R6
                STR     R6
                DEC     RC
                LDN     RC      ;LOAD CONSTANT
                DEC     R6
                STR     R6
                INC     RC
                INC     RC
                LDI     0F0H
                DEC     R6
                STR     R6
                OUT     7
                OUT     4
                OUT     7
                LDI     0F0H
                DEC     R6
                STR     R6
                OUT     7
                LDI     00H
                DEC     R6
                STR     R6
                DEC     R6
                INP     5
;**
                DEC     RB      ;ADD QUOTIENT TO PREVIOUS RESULT
                DEC     RB
                LDN     RB      ;LOAD LSB OF QUOTIENT
                ADD
                STR     RB
                INC     RB
                IRX
                LDN     RB      ;LOAD MSB OF QUOTIENT
                ADC
                STR     RB
                IRX
;**
```

```
361             LDN     R2      ;ADD RESULT TO ACCUMMULATOR REG. (R2)
362             DEC     R6
363             STR     R6
364             DEC     R2
365             LDN     R2
366             DEC     R6
367             STR     R6
368             DEC     RB
369             LDN     RB
370             ADD
371             STR     R2
372             INC     RB
373             INC     R2
374             IRX
375             LDN     RB
376             ADC
377             STR     R2
378             INC     RB
379             IRX
380 ;**
381             LDN     R2      ;ADD FINAL CONSTANT TO RESULT
382             DEC     R6
383             STR     R6
384             DEC     R2
385             LDN     R2
386             DEC     R6
387             STR     R6
388             LDN     RC      ;LOAD LSB OF CONSTANT
389             ADD
390             STR     R2
391             INC     R2
392             INC     RC
393             IRX
394             LDN     RC      ;LOAD MSB OF CONSTANT
395             ADC
396             STR     R2
397             IRX
398 ;**CONVERT TO DECIMAL DIGITS
399             LDI     0F2H    ;DIVIDE HEX NO. BY 100(64H)
400             DEC     R6
401             STR     R6
402             LDN     R2
403             DEC     R6
404             STR     R6
405             DEC     R2
406             LDN     R2
407             DEC     R6
408             STR     R6
409             LDI     64H
410             DEC     R6
411             STR     R6
412             LDI     0FCH
413             DEC     R6
414             STR     R6
415             OUT     7
416             OUT     4
417             OUT     5
418             OUT     6
419             OUT     7
420             LDI     0F0H
```

```
421             DEC     R6
422             STR     R6
423             OUT     7
424             INP     5
425             INC     R2
426             STR     R2      ;STORE MS DEC. DIGIT IN R2
427             INP     6
428             DEC     R2
429             STR     R2      ;STORE REMAINDER IN R2-1
430             LDI     0F2H    ;DIVIDE REMAINDER BY 10(0AH)
431             DEC     R6
432             STR     R6
433             LDN     R2
434             DEC     R6
435             STR     R6
436             LDI     0AH
437             DEC     R6
438             STR     R6
439             LDI     0FCH
440             DEC     R6
441             STR     R6
442             OUT     7
443             OUT     4
444             OUT     5
445             OUT     7
446             LDI     0F0H
447             DEC     R6
448             STR     R6
449             OUT     7
450             INP     5
451             STR     R2      ;STORE 2nd DEC. DIGIT IN R2-1
452             INP     6
453             DEC     R2
454             STR     R2      ;STORE LS DEC. DIGIT IN R2-2
455             INC     R2
456             INC     R2
457 ;**DISPLAY ASCII DIGITS
458             LDI     00H     ;DISABLE CDP1855
459             DEC     R6
460             STR     R6
461             OUT     1
462             LDI     0EH     ;TURN BLINKING CURSOR OFF
463             STR     RF
464             SEP     RE
465             LDI     20H     ;DISPLAY 3 SPACES
466             INC     RF
467             STR     RF
468             SEP     RE
469             LDI     20H
470             STR     RF
471             SEP     RE
472             LDI     20H
473             STR     RF
474             SEP     RE
475             LDN     R2      ;DISPLAY MS DEC. DIGIT
476             ADI     30H
477             STR     RF
478             SEP     RE
479             DEC     R2      ;DISPLAY 2nd DEC. DIGIT
480             LDN     R2
```

```
481             ADI     30H
482             STR     RF
483             SEP     RE
484             LDI     2EH     ;DISPLAY DECIMAL POINT
485             STR     RF
486             SEP     RE
487             DEC     R2      ;DISPLAY LS DEC. DIGIT
488             LDN     R2
489             ADI     30H
490             STR     RF
491             SEP     RE
492             INC     R2
493             INC     R2
494             DEC     RF
495             LDN     RD      ;DECREMENT EQN CNTR
496             SMI     01H
497             BZ      PT12    ;CHECK IF DONE
498             STR     RD
499             LDI     0F3H    ;LOAD 4 GHz CONSTANTS
500             STR     RC
501             LDI     77H
502             DEC     RC
503             STR     RC
504             LDI     2BH
505             DEC     RC
506             STR     RC
507             LDI     24H
508             DEC     RC
509             STR     RC
510             INC     R7
511             LBR     PT11
512 PT12        LDI     00H     ;SET RA FOR MUX CHNL 1
513             STR     RA
514             LDI     08H     ;SET LOOP CNTR TO 8
515             STR     RD
516             LDI     00H     ;INITIALIZE ACCUMULATOR
517             STR     R2
518             DEC     R2
519             STR     R2
520             LDI     02H     ;SET CURSOR TO HOME
521             STR     RF
522             SEP     RE
523             LBR     PT3
524
```

FIGURE CAPTIONS

Fig. 1. Chart for the patient measured with the prototype radiometer.

Fig. 2. Operative report for the patient measured with the prototype radiometer.

Fig. 3. Pathology report for the patient measured with the prototype radiometer.

Fig. 4. Photograph of the portable radiometer system.

Fig. 5. Photograph showing the location of the surface thermistor.

Fig. 6. Photograph showing the proper connection of the radiometer power supply cord to the battery pack.

Fig. 7. Photograph showing the blinking cursor in character position #1 on the liquid-crystal display.

Fig. 8. Photograph showing the display of surface and radiometric temperatures.

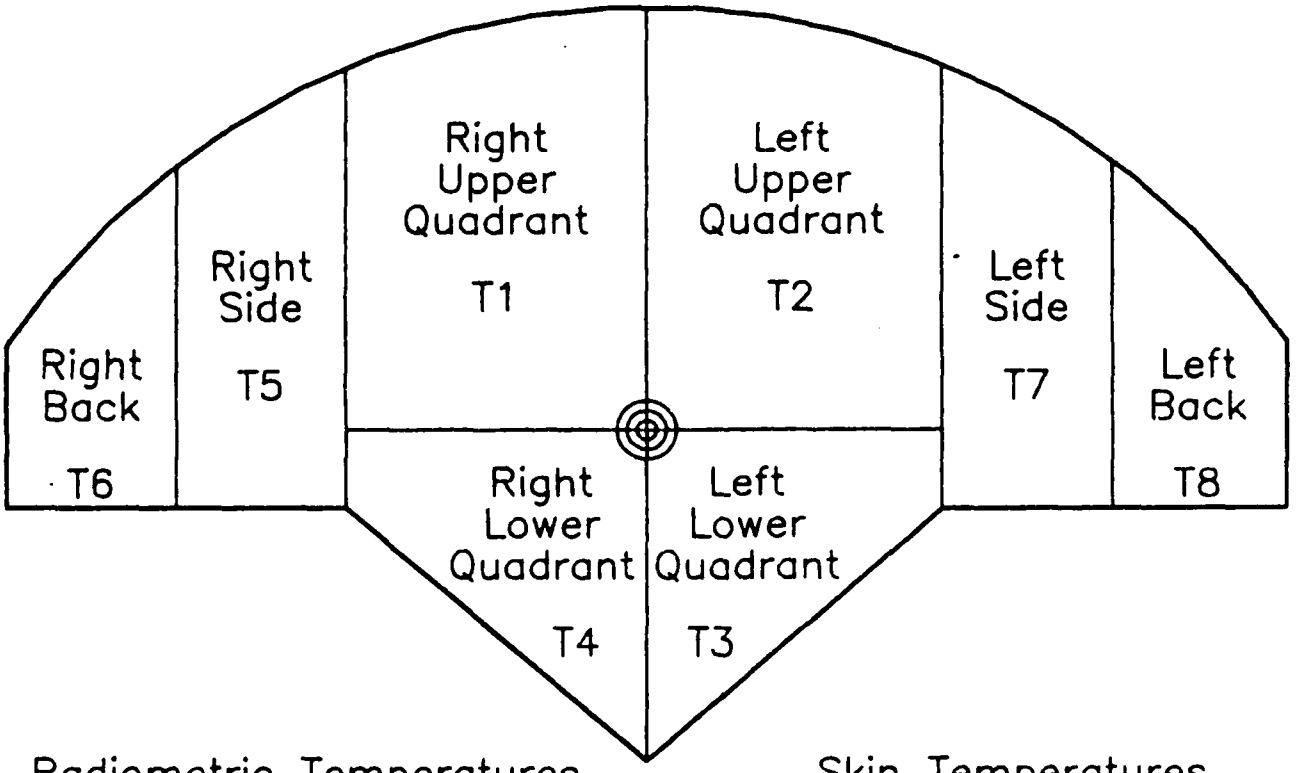
Fig. 9. Photograph showing the adjusting screwdriver in the hole in the cover of the radiometer enclosure.

Patient:_____ Date: 31 Oct 86

Hospital: HCO Physician:_____

Diagnosis: Acute Appendicitis

Comments: 3 cm of abdominal fat seen at time of surgery



Radiometric Temperatures						Skin Temperatures					
T6	T5	T1 35.5	T2 35.7	T7	T8	T6	T5	T1 31.9	T2 32.0	T7	T8
		T4 38.1	T3 36.7					T4 32.0	T3 32.0		

Pathology:_____

Fig. 1. Chart for the patient measured with the prototype radiometer.

THE HOSPITAL CENTER at ORANGE

OPERATIVE REPORT

PREOPERATIVE DIAGNOSIS: ACUTE APPENDICITIS.

POSTOPERATIVE DIAGNOSIS: ACUTE GANGRENOUS APPENDICITIS WITH PERITONITIS.

OPERATION PERFORMED: EXPLORATORY LAPAROTOMY, APPENDECTOMY WITH DRAINAGE OF PERITONEAL FLUID.

SURGEON: Dr. Patel
ASSISTANT: Dr. Monteagudo

DATE OF SURGERY:

FINDINGS: This patient had acute appendicitis with peritoneal fluid into the right gutter as well as the cul de sac. No other abnormality was found.

TECHNIQUE: Under general anesthesia the patient was prepped and draped in the usual sterile manner and a transverse incision was made which was carried through the subcutaneous tissue. Hemostasis was achieved by electrocoagulation. External oblique aponeurosis was split in the direction of its fibers and the internal oblique and transversalis was split in the direction of its fibers. The peritoneum was opened and as soon as it was opened, the peritoneal fluid was gushing out of the wound which was obtained for culture and sensitivity. Aspiration was performed. There was about 200 cc. of purlent fluid, foul smelling liquid was recovered. The appendix was stuck into the right adnexael area which was difficult to deliver. The incision was enlarged and it was delivered and removed under direct vision. The mesoappendix was clamped and ligated with #2-0 chromic catgut. The appendiceal stump was doubly ligated with #2-0 chromic catgut. No attempt was made to invaginate it. Appendectomy was performed in this fashion. The omentum was also stuck and was hemorrhaging initially so it was clamped and divided with #2-0 chromic catgut. Copious irrigation was performed in the right gutter and left gutter as well as the cul de sac. After satisfactory drainage of the peritoneal fluid and pus, the common viscera was returned to its anatomical position and the peritoneum was closed by #2-0 chromic catgut in continuous fashion and the internal oblique and transversalis was closed with purse suture with #2-0 chromic catgut. Each and every layer was successfully irrigated with Bacitracin solution. The external oblique was closed in a similar fashion. The subcutaneous tissues were closed with #3-0 chromic catgut. A Penrose drain was placed into the subcutaneous tissue and the skin was closed with clips. A sterile dressing was applied. The patient tolerated the procedure fairly well and the Penrose drain was secured with #2-0 black suture. Estimated blood loss about 30 cc. The patient tolerated the procedure fairly well.

DHIRAJKUMAR R. PATEL, M.D.

DRP:nac 6286-05
D: 12/4/86
T: 12/5/86

OPERATIVE REPORT

Form 44A. 7/78

Fig. 2. Operative report for the patient measured with the prototype radiometer.

Department of Pathology
Hospital Center at Orange
Orange, New Jersey 07051

Surgical Pathology - Tissue Examination

GROSS:

The specimen consists of an appendix and a segment of omentum. The appendix is 7 cm long and the proximal end is 1.2 cm in diameter while the distal end is 1 cm in diameter. The serosal surface is reddish-brown and dull and part of the surface contains some gray friable material. Separate pieces of omental fat measures 10 x 3 x 2 cm and is reddish-yellow and indurated. The surface is dull and covered by some gray friable material.

mg k

MICROSCOPIC:

The appendiceal lumen is filled with neutrophils which infiltrate through the wall. Part of the wall shows necrosis. The omental fat has fibrinopurulent exudate.

DIAGNOSIS: Acute gangrenous appendicitis with periappendicitis.
Omental fat with peritonitis.

(7)

Fig. 3. Pathology report for the patient measured with the prototype radiometer.

SURGICAL PATHOLOGY - TISSUE EXAMINATION

Pathologist S. Kondo, M.D. 11-4-86 Date

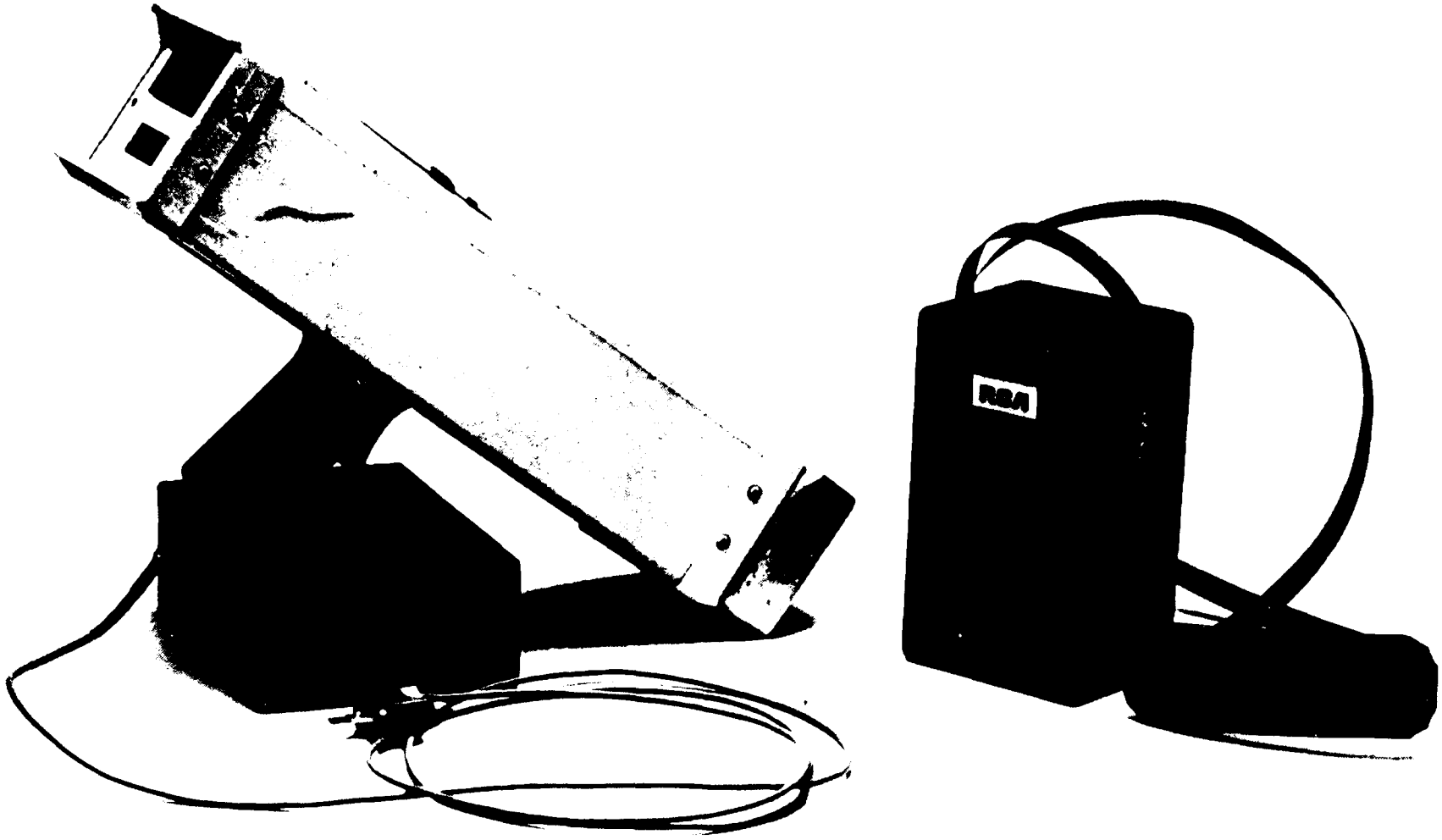


Fig. 4. Photograph of the portable radiometer system.

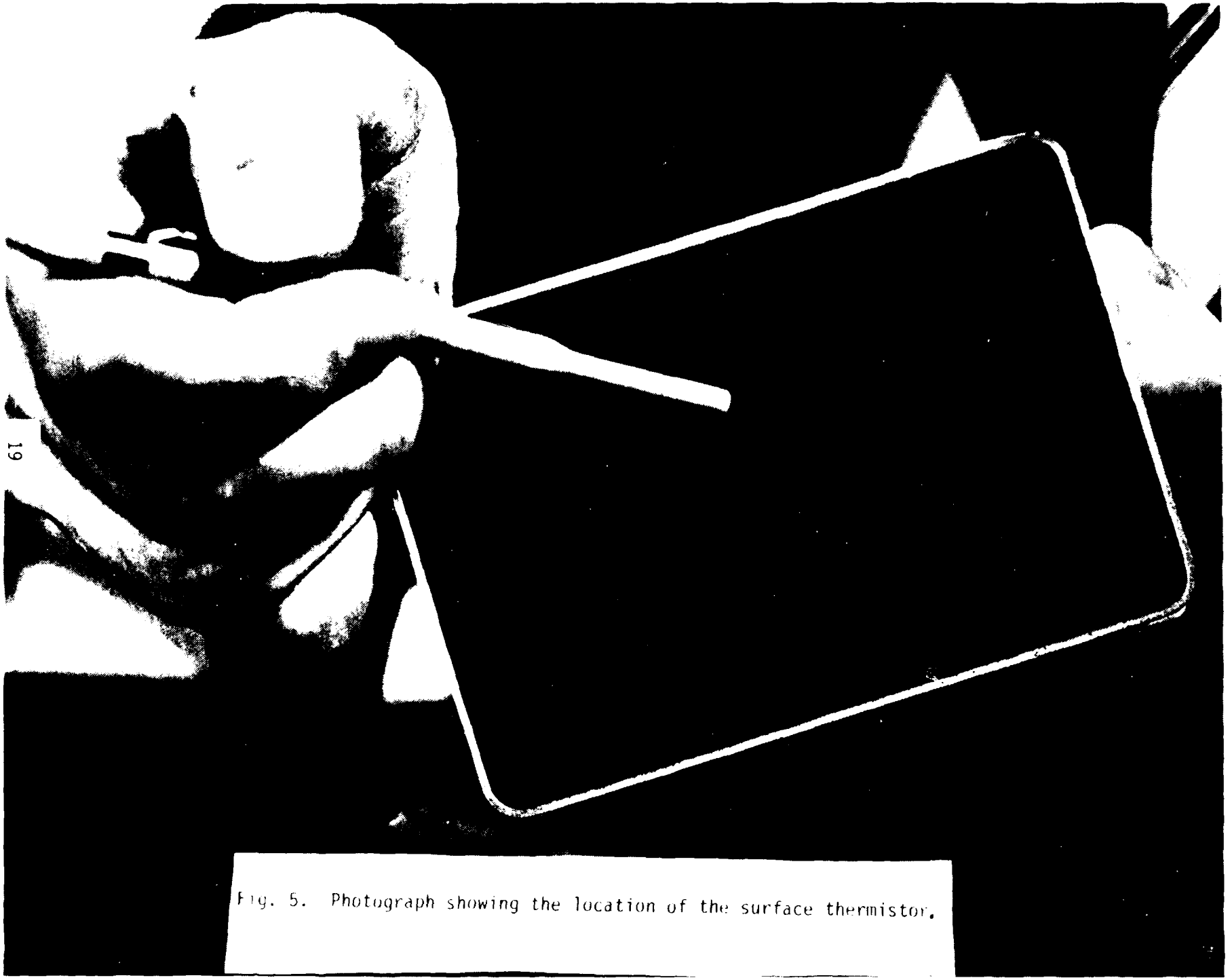


Fig. 5. Photograph showing the location of the surface thermistor.

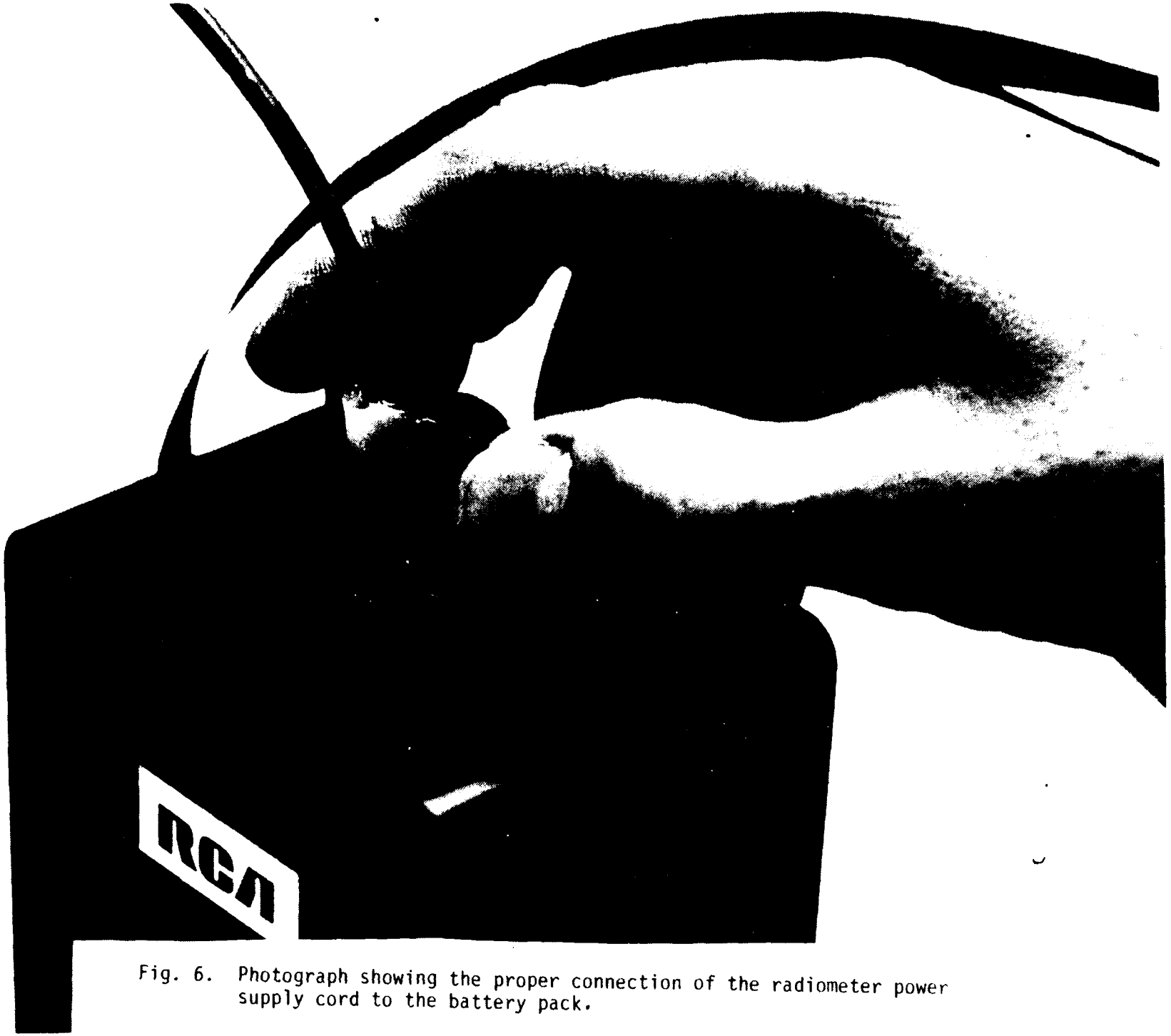


Fig. 6. Photograph showing the proper connection of the radiometer power supply cord to the battery pack.

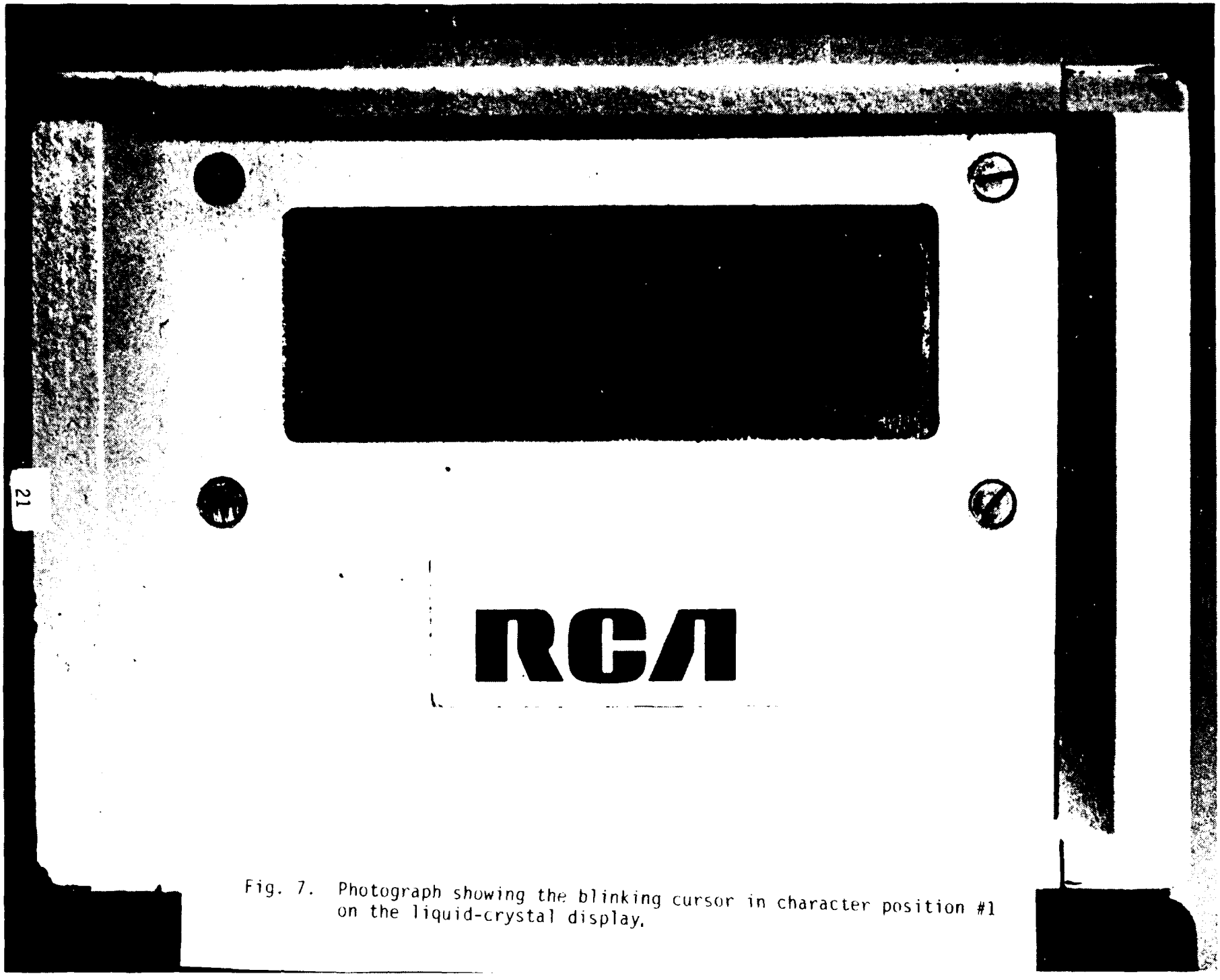


Fig. 7. Photograph showing the blinking cursor in character position #1 on the liquid-crystal display.

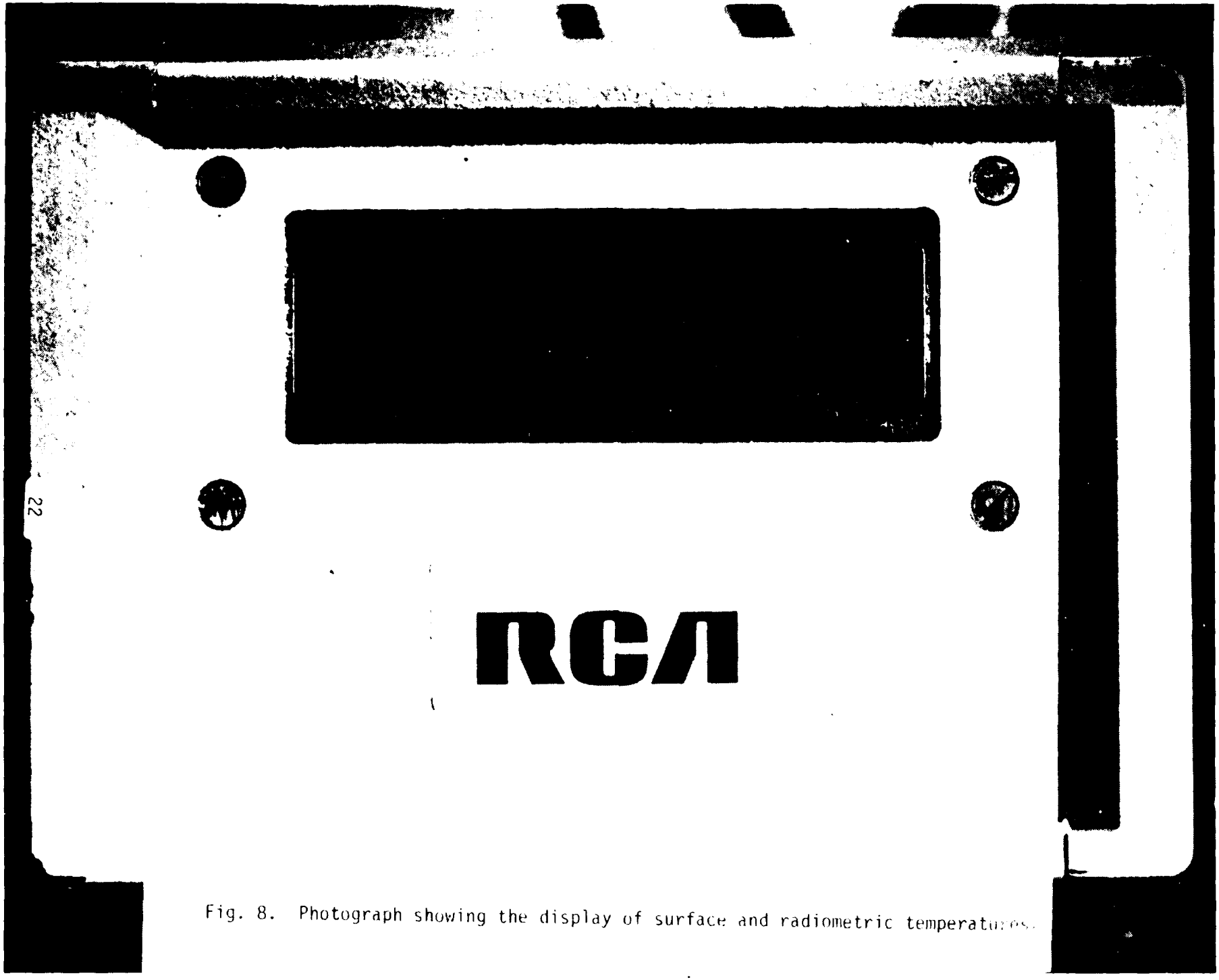


Fig. 8. Photograph showing the display of surface and radiometric temperatures.

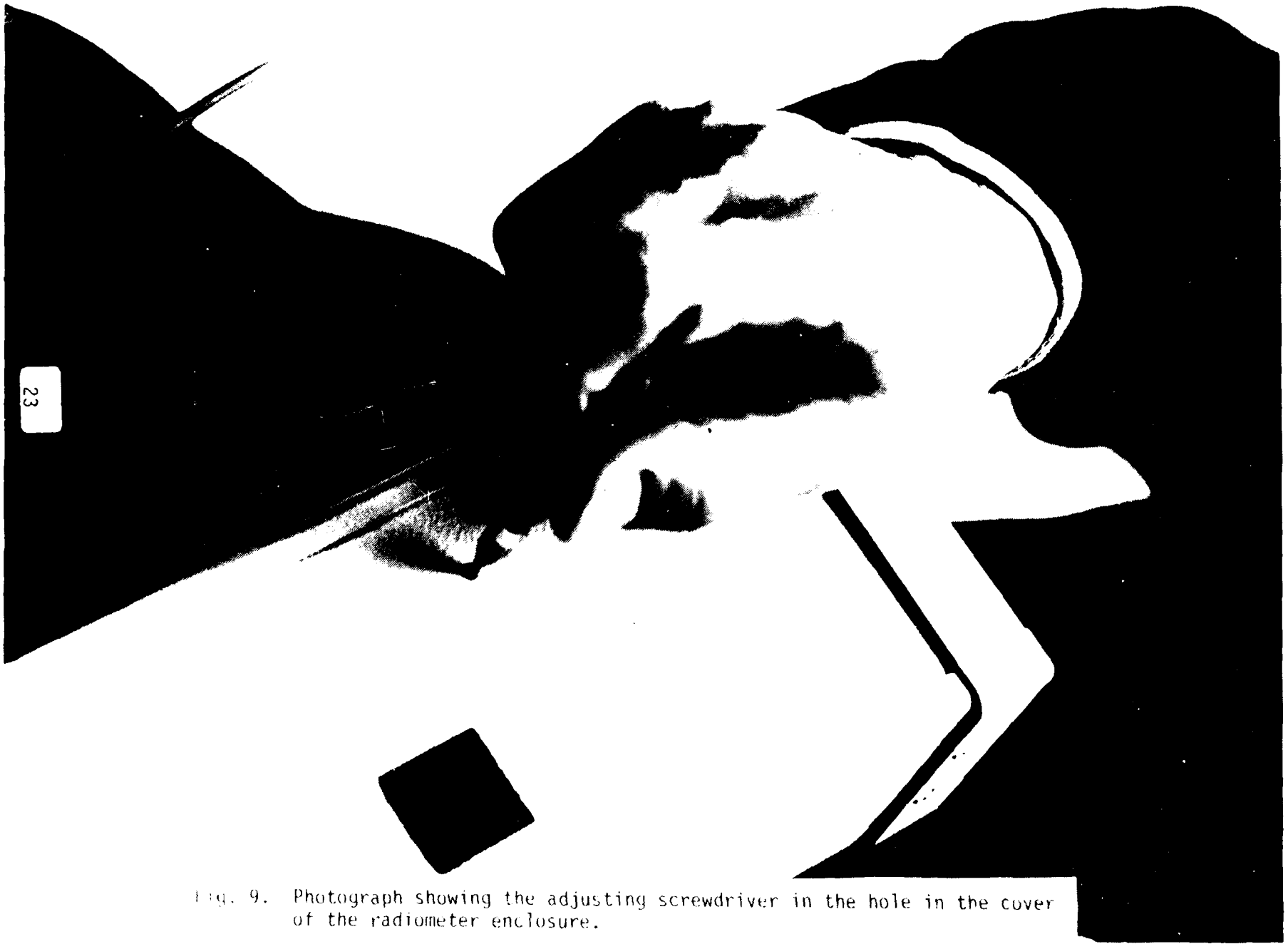


Fig. 9. Photograph showing the adjusting screwdriver in the hole in the cover of the radiometer enclosure.

END

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